SOME SILICIFIED ORDOVICIAN FOSSILS FROM SOUTH WALES

by NILS SPJELDNÆS

ABSTRACT. A preliminary description is given of a silicified fauna from the Upper Llanvirn or Lower Llandeilo of South Wales. The material consists mostly of trilobites, ostracods, and bryozoans. One new genus and two new species of ostracods are named, and the ontogeny of *Tallinnella complicata* (Salter) is described. Because of the silicified and fragmentary nature of the material, most of the numerous bryozoan species have not been named formally.

DURING the author's studies on some Ordovician brachiopods (Spjeldnæs 1959), it was discovered that a slab of limestone, stated to come from the Llandeilo of Llan Mill, near Narberth, Carmarthenshire, was rich in silicified fossils. The specimen, which belongs to the Geological Survey and Museum, London (no. 85415), is part of an old collection, and further details concerning the horizon and locality are not known. A description of the localities near Llan Mill is given by Strahan *et al.* (1914, pp. 31–33). The age of the fauna is discussed below.

The unsilicified fossils found on the slab are: *Macrocoelia* (*?*) *llandeiloensis* (Dav.), *Sowerbyella antiqua Jones*, *Horderleyella* cf. *subcarinata* MacGregor, *Dalmanella* cf. *parva* Williams, and other brachiopods (for the brachiopod fauna, see MacGregor 1961), indeterminate gastropods and cystid fragments.

The brachiopods, molluscs, echinoderms, and some of the trilobites are not silicified, and are preserved as moulds in the shale partings only. In spite of the small size of the slab (about $20 \times 8 \times 2$ cm.), it yielded, after solution in hydrochloric acid, several hundred silicified fossils, mainly ostracods, bryozoans, and trilobites. The silicified fossils are described below.

Except for the fragmentation, which might be a local feature only, the silicified specimens are excellently preserved, almost equal to the famous material from the Edinburgh Formation in Virginia, U.S.A. (cf. Whittington and Evitt 1956).

The author is deeply indebted to Dr. Stubblefield, Geological Survey and Museum, London, for the loan of the specimens, Dr. Gunnar Henningsmoen and Dr. A. L. Guber for inspiring discussions about the ostracods, and to Miss B. Mauritz and Mr. O. Brynhildsrud for photographing the specimens.

SYSTEMATIC DESCRIPTIONS

Class TRILOBITA

Marrolithus inflatus incipiens Williams 1948

Plate 36, fig. 1*a–b*

1948 *Marrolithus inflatus incipiens*—Williams, *Geol. Mag.* **85**, p. 77, text-fig. 6, pl. vi, fig. 2.

Material. Very plentiful (about 120 fragments), but fragmentary. In most specimens, only one-half of the fringe is preserved, and this prevents a statistical study of the material.

[Palaeontology, Vol. 6, Part 2, 1963, pp. 254–63, pl. 36–37.]

The wide range in size of the specimens allows a study of the variation of the fringe. In the largest specimens, the raised pits are more numerous, and they approach *M. inflatus inflatus*. In the smaller specimens the number of raised pits gradually decreases with size, and in the smallest specimens they are absent.

The preservation of the material shows that the pits are continuous, and hyperbolic in cross-section. The raised pits are steeper (more cylindrical) than the ordinary ones.

In *Tretaspis*, from studies made by Störmer (1930), it is known that the pits are hour-glass-shaped, parted by a suture in the middle. In *M. inflatus incipiens* no suture is observed, and the curvature of the walls of the pits is the reverse of that found in *Tretaspis*.

Other trilobites. The other silicified trilobites are *Flexicalymene cambrensis*, indeterminable asaphid fragments, and a small cephalon of an *Ampyx sp.*, which was broken during preparation.

Class CRUSTACEA
Subclass OSTRACODA
Tallinnella complicata (Salter)

Plate 36, figs. 9–13, text-fig. 1

1947 *Tetradella complicata* (Salter)—Harper, *Geol. Mag.* **84**, pp. 345–53 (for further references, see this paper).

Material. Four hundred valves which were sufficiently complete for measurement, and a large number of fragmentary valves. As mentioned above, it is possible that this is topotype material of Salter's species.

Description. The markedly preplete valves are rather flat in profile in adult specimens, whereas in the larval instars they are more regularly swollen. In all stages the surface is smooth, except for the four distinct lobes, two of which (L1 and L3) protrude over the hinge-line.

The smaller larval valves also have a marginal row of short, thin spines which are not found in the adults.

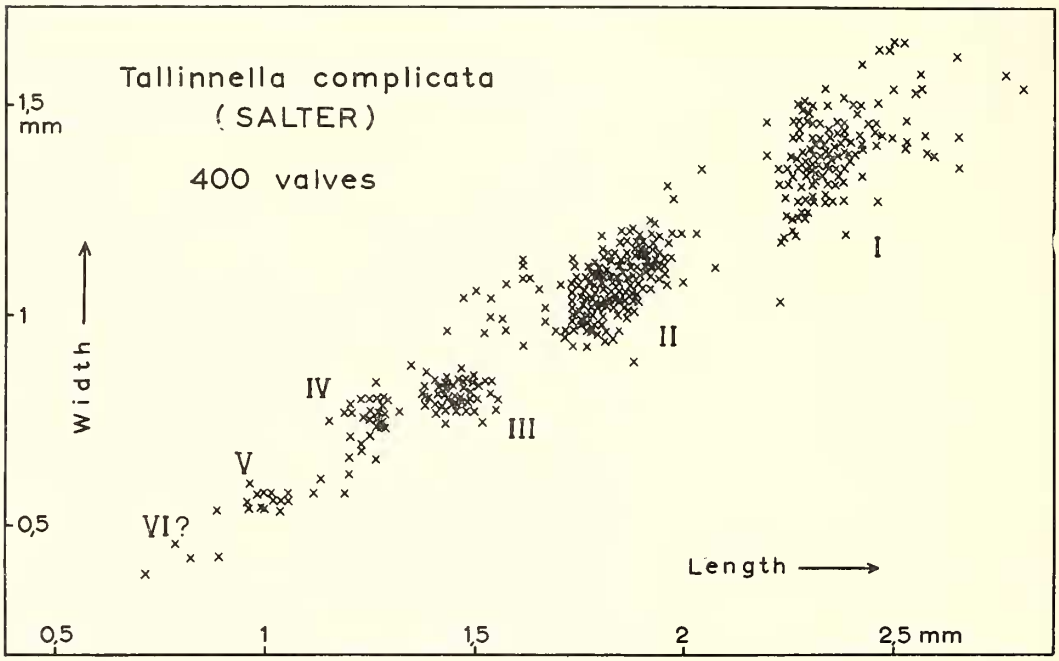
The hinge itself is generally smooth in both valves; some teeth-like structures were observed, but, as usual in silicified specimens, it is very difficult to determine if such delicate structures are original or due to somewhat capricious silicification. It is, anyhow, not a constant feature in the present material.

Some slight variation was observed in the material present, especially in the size of the swollen ends of L1 and L3, and in the outline of the domicilium.

Text-fig. 1 records measurements of 400 valves. Several growth stages are discernible (I–VI). Some of them have the size theoretically expected (growth factor about 1·26, cf. Spjeldnæs 1951), but between the third and fourth larval stage the difference in size is much smaller than expected, especially the width, which is almost the same in both.

If the growth series demonstrated by the stages VI–V–IV is extrapolated according to Brooke's law, the theoretical stage III should be about 1 mm. wide and 1·5–1·6 mm. long. Some few specimens of this size are found, in addition to the normal stage III. If, similarly, the growth series of the larger stages I–II–III are extrapolated, the theoretical stage IV will fit with some few scattered specimens, and not with the majority observed in stage IV. This peculiar disconformity in the growth series might be due either to a mixing of two populations, or an unknown feature in the ontogenetic development of *T. complicata*.

Öpik (1937) suggested that *Tallinnella* showed sexual dimorphism, and this is confirmed by the present material. About 30 per cent of the adult specimens show a prominent velar flange in the anterior part (Pl. 36, fig. 12), and about 40 per cent are without this flange (Pl. 36, fig. 13). In the rest, this feature could not be observed clearly. Variation in size of the flange was observable but small, and all specimens in which the inside was well preserved could be referred to one of the two dimorphs without doubt.



TEXT-FIG. 1. *Tallinnella complicata* (Salter) from Llan Mill, near Narberth, Geol. Surv. Mus. No. 85415. Measurements of 400 valves, showing instars.

Remarks. This species resembles in most features *T.* (*?*) *bohemica* (Barr.) as described by Jaanusson (1957, pp. 342–3, pl. x, fig. 3). The lobes are stronger, and the extralobal area is not visible in lateral view in *T. complicata*. The limitation of the genus *Tallinnella* is not considered here, the term is used in the wide sense of Henningsmoen (1953, pp. 213–14), and not in the more restricted sense of Jaanusson (1957). *T. complicata* differs considerably from the type species, *T. dimorpha*, especially in the development of the extralobal area.

Genus GUNNAROPSIS gen. nov.

Diagnosis. Four-lobed ostracods with L1, L2, and L3 each developed as a sharp crest, and L4 as a gentle swelling. A histial (?) flange starts at the upper anterior end of the domicilium, turns almost horizontal below L1–3, and stops abruptly in the lower part of L4. A velar (?) flange starts just in front of the middle of the valve, and runs parallel to the histial flange almost to the upper posterior corner, where it stops abruptly. Dimorphism not observed.

Type species. Gunnaropsis cristata sp. nov.

Remarks. This genus resembles some from the Lower Ordovician, such as *Rigidella* Öpik, *Protallinnella* Jaanusson, and *Tallinnellina* Jaanusson. It differs from them, and, as far as the author knows, from most other Palaeozoic ostracods in that the velar and histial flanges are not parallel to the margin of the valves. *Gunnaropsis* also differs from the three mentioned genera in that its four lobes are not distinctly united, and that L4 is developed as a rounded ridge, contrasting with the sharp edges of the other lobes. In the other three genera, the differences between the lobes in this respect are much less strong.

The family relationship of *Gunnaropsis* is at present obscure, especially since the presence or absence of dimorphism, and the possible type of dimorphism, cannot be ascertained because of the small amount of material present. The three other genera mentioned, as well as *Tallinnella*, have been referred to the Quardijugatorinae by Jaanusson (1957, pp. 338–40), but it is rather doubtful if *Gunnaropsis* can be accommodated to this subfamily.

Gunnaropsis cristata sp. nov.

Plate 36, fig. 6

Diagnosis. Same as diagnosis for genus.

Description. Outline of valves slightly preplete, with long, straight hinge-line. L1, L2, and L3 have sharp crests, and L1 and L2 are connected ventrally, forming a sharp V. L4 is well developed, but lacks a crest in its dorsal part. L3 protrudes over the hinge-line, and this is generally the case also with L1 and L4, but to a lesser extent.

There are two flanges; one, which is interpreted as the velar, starts below L1–2, at the margin of the valve, and ends abruptly beside L4, just before reaching the hinge-line. The distance from the margin of the valves increases gradually. Below L1–2, it is found at the margin of the valve; at the end, it is in close contact with L4, some distance from the margin.

The other flange, which is interpreted as a histial one, starts at the upper anterior end of the valve, near the margin, and the distance from it gradually increases. Below L1–2, it joins the connecting lobe and turns horizontally. It ends abruptly in the ventral part of L4.

Fifteen specimens of this species were found, the larger ones being about 1·5 mm. long and 0·9 mm. wide. Some smaller specimens, about 1·0 mm. long and 0·55 mm. wide, probably represent a larval stage. No dimorphism is observed, and it is possible, also, that the larger specimens are not adults.

Ceratopsis britannica sp. nov.

Plate 36, fig. 7

Diagnosis. A long and low *Ceratopsis* species with a prominent carina-like bulge connecting L1 and L4.

Description. The holotype is 1·3 mm. long and 0·7 mm. wide. L4 is faintly developed, L3 is prominent and rounded, L2 is shorter, but still prominent, and L4 continues into the rounded triangular 'horn' with strong horizontal striation, which is characteristic for

this genus. A histial (?) bulge unites L4 and possibly L1. It is blunt-edged, and directed outwards. A velar flange is developed, and is widest in the anterior part of the valve. No sexual demorphism was observed among the about 20 specimens studied.

Some of them are rather small (1·0–1·1 mm. long and 0·55 mm. wide), representing larval stages, and as usual the lobes are bulbous and diffuse. The horn on L4 is also proportionally much longer in the smaller specimens. This species differs from the other members of the genus in the proportions, and in the strong development, of the carinal bulge.

Lomatobolbina sp.

Plate 36, fig. 8

Seven specimens of this species are present, both tecnomorphs and heteromorphs. An average specimen is 1·2 mm. long. Because of the development of a histial dolon, the sigmoidal sulcus S2, and the strongly developed posteroventral lobe, it probably belongs to *Lomatobolbina* Jaanusson (1957, pp. 395–9). It resembles *L. mammillata* (Thorslund) cf. Jaanusson (1957, pl. 12, figs. 6–8) in the absence of a distinct node on the posteroventral lobe, but differs from it in outline, and in the more anterior position of S2.

Other ostracods. In addition to the species described above, there are also some smooth specimens in the material present. One species represented probably belongs to *Conchoprimitia*, but the number of undamaged valves is too small (4–5 specimens) for a detailed description. The other smooth valves are very small, and of different shapes. Some of them might be young larval valves.

Phylum BRYOZOA

Bryozoans are very abundant in the material, but they are generally fragmentary. In order to give a modern description of Ordovician bryozoans, thin sections are absolutely necessary, especially for the Trepostome bryozoans, and also for Cryptostomes. As it is

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EXPLANATION OF PLATE 36

All specimens belong to the Geological Survey and Museum, London. The specimens have not been whitened and the photographs are not retouched. All the specimens come from the Upper Llanvirn or Lower Llandeilo at Llan Mill, near Narberth, Carmarthenshire.

Fig. 1. *Marrolithus inflatus incipiens* Williams. Upper (fig. 1*a*) and lower (fig. 1*b*) sides of a fragment of the fringe, ×about 6.

Figs. 2, 4. *Mesotrypa* aff. *lens* (M'Coy). 2, Lower surface of a zoarium, showing numerous mesospores surrounding the zooecia. 4, Upper surface of another zoarium, showing only very few and small mesospores, ×about 8.

Fig. 3. *Orbignyella favulosa* (?) (Phillips). Upper surface of a fragmentary zoarium, ×about 8.

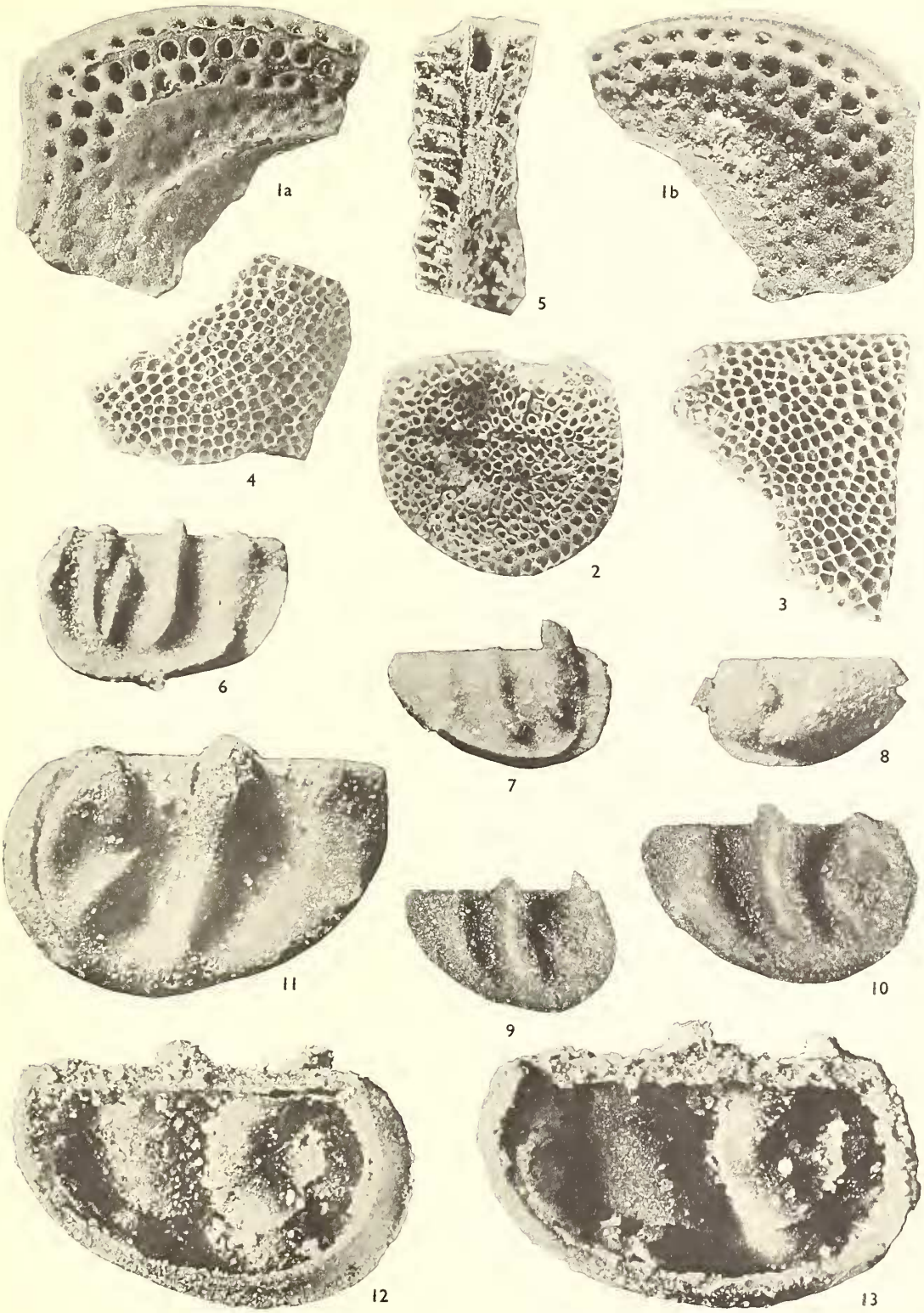
Fig. 5. Indeterminate trepostome bryozoan D, showing central tube in a fragmentary zoarium, ×18.

Fig. 6. *Gunnaropsis cristata* gen. and sp. nov. Holotype. Large, complete valve, ×27.

Fig. 7. *Ceratopsis britannica* sp. nov. Holotype, × 27.

Fig. 8. *Lomatobolbina sp.*, ×27.

Figs. 9–13. *Tallinnella complicata* (Salter). 9, 10, Young instars of the two last larval stages, ×27. 11, Exterior of an adult valve with histial dolon (female?), ×27. 12, Interior of an adult valve with histial dolon (female?), ×27. 13, Interior of an adult valve without histial dolon, ×27.



SPJELDNÆS, Silicified Ordovician fossils

difficult to get good thin sections from silicified material, description of the species from the present material must remain incomplete at present. Therefore no new species have been named even though the whole fauna is new. The external features, as usual in silicified material, are very well preserved, and this, combined with the few features of the interior which were observed, gives some indication of the type of fauna found.

Order TREPOSTOMATA

Orbignyella favulosa? (Phillips)

Plate 36, fig. 3; Plate 37, figs. 12*a–b*

(?) 1957 *Orbignyella favulosa* (Phillips 1848)—Spjeldnæs, pp. 367–8, pl. 12, figs. 3, 7. (For further references, see this paper.)

Thin encrusting zoaria probably referable to this species are common. They differ from the type in being thinner, and smaller in diameter. The typical curved diaphragms are observed only in the larger specimens, but the maculae can be seen clearly, and acanthopores and mesopores are absent, both at the base and surface of the zoaria.

The type of this species (GSM 56404, cf. Spjeldnæs 1957, p. 367) comes from the Llandeilo Limestone of Llan Mill, and the present material might therefore be topotypes. The detailed locality and horizon is, however, not known either for the type or for the present material.

Mesotrypa aff. *lens* (M'Coy)

Plate 36, figs. 2, 4

Externally this species resembles *O. favulosa*, but it has smaller zooecia, less-developed maculae, and shows the characteristic development of the mesopores. They are clearly visible at the base of the specimens (Pl. 36, fig. 2), but very few are seen at the upper surface (Pl. 36, fig. 4).

The present material differs from the types (cf. Spjeldnæs 1957, pp. 368–70, pl. 13, figs. 5, 7, text-fig. 1C–E) in its smaller size and less-developed maculae. There are also fewer tabulae in the zooecia.

Species of this kind, usually referred to as '*Nebulipora lens*' in the older literature, are common in the British Middle Ordovician, and seem to replace the *Diplotrypa petropolitana*, which is the most common trepostome bryozoan in the Scandinavian–Baltic Province, and rather rare in Britain.

Indet. Trepostome A

Plate 37, fig. 7

Ramose zoaria, with branches about 2·5 mm. thick. Bifurcation unknown. The elongate-rounded zooecia have thick walls, and are almost completely surrounded by the numerous, rounded polygonal mesopores. There are numerous small acanthopores. No tabulae have been observed in the zooecia (only the outer part of the exozone is preserved), but the mesopores appear to be tabulated.

This species is the most common ramose trepostome bryozoan in the material.

Indet. Trepostome B

Plate 37, fig. 6

Thin ramose zoaria (branches approximately 0·5 mm. in diameter) without branching in the fragments at hand. Zooecia rather large (approximately 0·06 mm. in diameter), polygonal, and with few mesopores. Walls thin, and no acanthopores observed. Only few diaphragms have been observed in the zooecia and in the mesopores. A considerable variation is found as to number and arrangement of the mesopores, but maculae are not developed.

This species recalls thin-branched species of *Hallopora*, but generic identification cannot be confirmed without thin sections.

Indet. Trepostome C

Plate 37, fig. 8*a–b*

A small zoarium forming a hollow cone about 2 mm. in diameter, and 1 mm. high. Large, polygonal zooecia with thick walls. No mesopores and acanthopores observed. No diaphragms.

The conical shape might either be due to incrustation of a conical object, or it might be the normal shape of the zoarium. The material is insufficient for a final decision.

Indet. Trepostome D

Plate 36, fig. 5

Externally the zoaria appear to be normal ramose ones, with 1–1·2 mm. diameter, but cross-sections show that the colony was formed around a hollow tube with 0·3 mm.

EXPLANATION OF PLATE 37

All specimens belong to the Geological Survey and Museum, London. They come from the Upper Llanvirn or Lower Llandeilo of Llan Mill, near Narberth, Carmarthenshire. The specimens have been whitened with ammonium chloride, but the photographs have not been retouched.

Figs. 1–5. Arthrostylid cryptostome bryozoans. Six fragments of zoaria, three of which (figs. 1, 2, and 5) have the articulated base preserved. They illustrate the wide range of variation found in this material, ×30.

Fig. 6. Indeterminate trepostome bryozoan B. Fragment of a zoarium with unusually many mesopores, ×18.

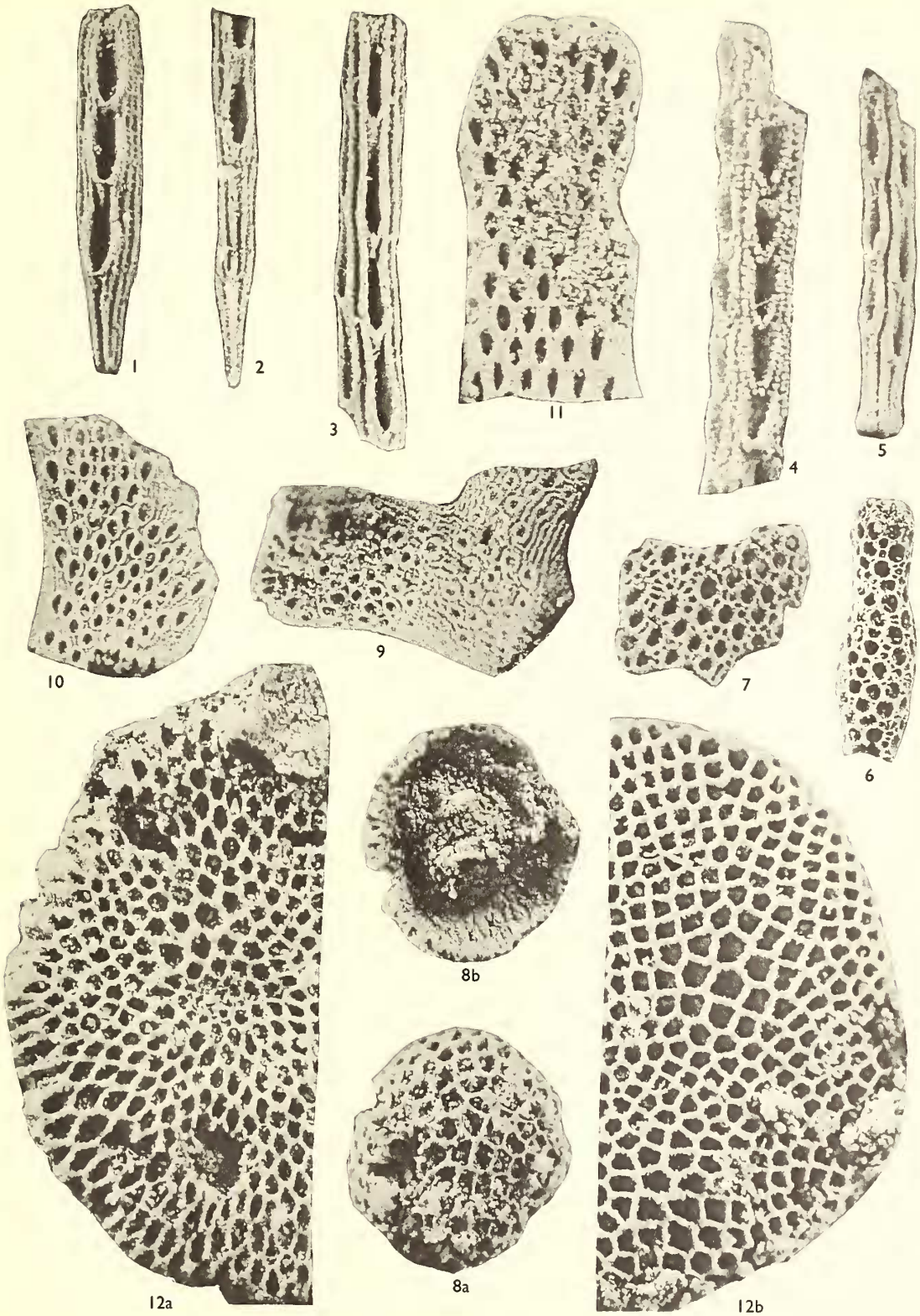
Fig. 7. Indeterminate trepostome bryozoan A. Fragment of the surface of a zoarium, ×18.

Fig. 8. Indeterminate trepostome bryozoan C. The only complete zoarium seen from above (fig. 8*a*) and below (fig. 8*b*), ×18.

Figs. 9, 10. Indeterminate bifoliate cryptostome bryozoan A. 9, A fragment of an old zoarium, showing rounded zooecial apertures, and zooecia covered with surface sculpture, ×18. 10, A fragment of a young zoarium, ×18.

Fig. 11. Indeterminate bifoliate cryptostome bryozoan B. Fragmentary zoarium, ×18.

Fig. 12. *Orbignyella favulosa?* (Phillips). Half of a zoarium seen from above (fig. 12*b*) and below (fig. 12*a*), ×18.



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